Chapter Seven
MANAGEMENT AND MAINTENANCE PRACTICES

The practices described below are meant to provide the greater level of detail needed to carry out maintenance and project-specific work outlined in this VMP. Chapter 6 and 7 are meant to be used together to describe **what** is to be done, **when**, and **where** (Chapter 6) and specifically **how** to do it (Chapter 7). The following practices for maintaining, restoring, establishing or removing vegetation have been developed with adaptation in some portions from Seattle DPR Landscape, Horticulture and Urban Forestry Best Management Practices Manual (BMPs) (1999) and 'City Among the Trees' (1998). These practices have been crafted to address conditions present at Lincoln Park. Specific emphasis has been provided for control of non-native invasive species, and how to care for, establish, and maintain native vegetation in natural area restoration and enhancement projects at the Park.

7.1 Mulching

[Adapted from DPR Landscape, Horticulture and Urban Forestry BMPs (1999) & 'City Among the Trees' (1998).]

Mulching is one of the easiest and most important maintenance practices for protecting and nurturing all vegetation types. Mulching is an essential component of any natural area planting project for suppressing weeds/ invasives and thereby reducing root competition, to conserve soil moisture and keep soil cool, and to add organics to the nutrient-deficient soils. In developed landscape areas it also serves these functions, as well as adding a cared-for appearance. Mulching material in developed landscape areas may include bark products, wood chips, compost, GroCo, grass clippings, cardboard, leaves or pebbles. In natural areas, the most desirable mulch material is a combination of cardboard sheet mulch overlain by 4-6" of wood chips. Compost, GroCo, or leaf mulch can be added either on top of or underneath the cardboard layer if soil amendments are desired. Where large areas of invasives have been removed, the entire planting area should be sheet mulched and wood chipped to minimize re-invasion. In most cases, wood chips of recycled Parks Department plant material are available at no cost. Plastic, landscape fabric or inorganic mulch should be avoided in most cases, except as specified for highly invaded areas., where it may be the most effective strategy.

Trees

- Clear weeds and grass from under the tree, in a circle out to the drip line at the tips of the branches.
- Where weeds are very aggressive, use a "sheet mulch" of thick layers of newspaper or cardboard.
- Spread layer of organic mulch, 2-4" deep in developed landscape areas, 4-6" deep in natural areas, in a circle out to the tree's drip line or in a 3' diameter circle (whichever is greater).
- Keep mulch away from the tree trunk to prevent crown rot or insect damage.
- Maintain 3"-4" of mulch annually in developed landscape areas, 4-6" in natural areas (during 3 year establishment period or beyond as needed).

Shrubs

- Follow similar procedures as for trees, above.
- Spread layer of organic mulch 2-3" deep in developed landscape areas, 4-6" deep in natural areas and 2-3' in diameter around shrub.

- Cover entire planting bed with mulch where applicable.
- Keep mulch away from contact with crown of plant.

Herbs

- Flowerbeds and smaller plant material should be mulched with finer material.
- Spread layer of mulch 1-2" deep depending on size and spacing of plants.
- Avoid drift of mulch onto turf or pavement by recessing edge of beds.
- Do not smother plant crowns with mulch.

7.2 Planting

The basic procedure of plant installation is essentially the same whether in a developed landscape or in a natural area. Site preparation, species selection, and planting layout are site-specific and depend on the goals of the project as well as the micro-site conditions. Instructions for planting trees, shrubs, and herbaceous material are given below. Because the broad goals of any natural area planting include restoration of a functional native plant community, information about species choices and plant palettes for planting in natural areas is given in Tables immediately following. Plant selection for use in developed landscapes can have a wider range of options, in particular including non-native species, and should also be informed by historic information when relevant.

Trees

The two basic steps in planting are preparing the site, and setting the tree or shrub. Proper preparation will encourage root growth rather than adding to the difficulties already challenging the newly planted trees or shrubs.

- Ideal planting hole is 2-3x the diameter of the root spread or the root ball (depending on existing soil conditions)
- Minimum planting hole is 12" wider than root spread or root ball
- Hole shall be no deeper than the ball and the ball shall sit firmly on the undisturbed subsoil
- Native soil shall be used to backfill the planting hole except in situations where the existing soil is contaminated or filled with rubble or pure clay
- Trees shall not be fertilized at the time of planting
- Balled-and-burlapped trees shall be placed in the hole and plumbed vertically. All rope shall be removed from around the trunk of the tree and the top 1/3 of the burlap shall be folded back down into the hole. Whenever possible complete removal of the top third of burlap by cutting it away with a sharp knife is preferred. Do not remove any B&B packaging material until the tree is placed in the hole and securely plumbed into its final position.
- Trees in wire baskets shall have <u>all</u> of the basket removed, using bolt cutters
- Backfill soil in lifts of 4-6" at a time with compaction of each layer. Do not compact muddy backfill. Water thoroughly after backfilling to settle the soil, eliminate air pockets and re-wet the root system.
- If project scope allows, watering soil rather than compacting is preferred. Backfill ½ the soil in the tree pit and thoroughly drench with water to settle. Complete backfilling and then thoroughly drench with water again. This method is preferred for removing air pockets and settling soil, but can be impractical on big jobs or jobs using volunteers.
- Trees planted in sandy or loamy soils should have a 3" high berm erected just past the perimeter of the planting hole to funnel water to the root ball and wet the hole/sidewall interface.

- Berms should not be constructed in clay soils or on heavily compacted sites.
- Stake only in situations where normal planting procedures does not provide a stable plant, otherwise, staking is not generally required.
- Staking is sometimes recommended as a vandal deterrent device or to prevent mechanical injury from mowers or trimmers. Ties for stakes should be some biodegradable or flexible fastener that precludes collaring of the trunk if the ties are not removed in a timely fashion.
- Stakes shall be removed at the end of the first year.
- Plant trees at the depth they were growing in the nursery.
- Do not wrap tree trunks.
- Remove tree trunk wrapping materials, tags, and all ties at the time of planting.

Shrubs *(refer to general guidelines for trees, above)*

- If needed, incorporate fertilizer into soil before adding plants.
- Wait until plants are established before adding chemical fertilizer.
- Plant at proper depth taking into consideration room for mulch.
- Plant shrubs with proper spacing to allow for spread at mature size.
- Plant bareroot stock at the same grade as grown in the nursery.

Herbs

- Plant ground cover and floral plantings to provide adequate coverage to compete with weeds.
- In landscaped beds, plant to provide effective display.
- Do not crowd.
- Remove containers prior to placement in the planting pit.
- Tease pot-bound roots with hands or tools prior to final placement in planting pit.
- Protected bare root plants from root drying prior to and immediately after planting.
- Cleanly prune exceptionally long roots to create a uniform root mass.

Live Stakes

Live stakes are cuttings harvested from live native plants. Stakes are cut from the parent plant, and then installed directly into the soil where they establish roots and grow to maturity. The best species to use for live stakes are willow species, black cottonwood, and red osier dogwood. Stakes should be planted in areas that will be consistently moist through out the growing season, such as along the waterline at the lakeshore and in wetland areas. Although live staking can be done throughout the year, to maximize survival the best time for taking cuttings and installing them is during the dormant season, between early November and late February.

Stakes can be harvested from an appropriate site or purchased. They should be installed as soon as possible after harvesting – ideally within 24-72 hours – and kept wet in a bucket and in the shade until installation. Stakes should be at least 2-3’ in length and >¾” diameter for willows and cottonwood, and >½” diameter for red osier dogwood. If harvesting your own stakes, no more than 5% of the parent plant should be removed at any one time. Stakes should be installed with a rubber mallet if the ground is soft enough, or by using a planting bar to create the hole in more compacted soils. The stake should be installed with ¼ of stake above ground and ¾ of stake below ground. There should be good soil contact below ground for the length of the stake. [Adapted from DPR’s Landscape, Horticulture and Urban Forestry BMPs (1999) and King County Water and Land Resources Bulletin “Live Stake Cutting and Planting Tips.”]

Table 7.1. Native Plant Species and Microclimate Requirements

Table format and information is derived from field observations and the following documents: King County DDES Sensitive Area Mitigation Guidelines Habitat Worksheet (1999); Ecology Publication #93-17 "Restoring Wetlands in Washington" by Stevens and Vanbianchi (1993); Flora of the PNW (Hitchcock & Cronquist); Plants of the PNW Coast (Pojar & MacKinnon); Wetland Plants of Western WA (Cooke); Guidelines for Bank Stabilization Projects and Surface Water Design Manual (King County); Proceedings of the Puget Sound Wetlands and Stormwater Management Research Study (9/26/96); Natural Vegetation of Oregon and Washington (Franklin and Dyrness).

Table Abbreviations

Light Needs:
SI=Shade Intolerant
SD=Shade Dependent
ST=Shade Tolerant
HA=Highly Adaptable

Site Placement:
X =Drier (Xeric)Upland
M =Moister (Mesic)Upland
WE=Wetter
SS=Saturated Soils
SW=Shallow Water

Scientific Name	Common Name	Max Ht.	Light Needs	Site Placement	Spacing	Comments
TREES						
Abies grandis	grand fir	125'	SI-ST	X	12-15'	Best conifer for soil binding roots
Acer macrophyllum	big leaf maple	100'	SI-ST	M,X	12-15'	Seral/sprouter - shallow rooter
Alnus rubra	red alder	80'	SI-ST	M,X	5-10'	Seral, sprouter & spreader
Arbutus menziesii	Pacific madrone	80'	SI	X	12-15'	Likes drier, coastal: slow-grower
Cornus nuttalli	Pacific dogwood	70'	ST	M	10-15'	Understory or forest edge tree
Fraxinus latifolia	Oregon ash	80'	SI-ST	WE,SS	12-15'	Requires flat, damp soils
Picea sitchensis	Sitka spruce	230'	SI	WE,SS	12-15'	Wettest conifer
Pinus contorta	shore pine	60'	HA	WE,M,X	10-15'	Tolerates poor soil
Populus balsamifera	black cottonwood	200'	HA	WE,SS,M	10-15'	Seral; sprouter
Populus tremuloides	quaking aspen	75'	SI	X	5-10'	Seral in montane
Prunus emarginata	bitter cherry	50'	SI	M	5-10'	Seral in mesic conditions
Pseudotsuga menziesii	Douglas fir	300'	SI	M,X	12-15'	Driest conifer-seral, fast grower
Quercus garryana	Garry oak	80'	SI	X	12-15'	In groves, slow-growing
Taxus brevifolia	Pacific yew	80'	ST-SD	M	12-15'	Very slow growing
Thuja plicata	western red cedar	230'	SD	SS,WE,M	12-15'	Basic to PNW & wetlands
Tsuga heterophylla	western hemlock	200'	SD	X, M	12-15'	Dry conifer, needs lots of organic in soil
SHRUBS						
Acer circinatum	vine maple	25'	SD	M,X	6-10'	Needs canopy shade or lots of moisture.
Amelanchier alnifolia	serviceberry	20'	SI	X	6-10'	Edge-loving

Scientific Name	Common Name	Max Ht.	Light Needs	Site Placement	Spacing	Comments
SHRUBS, cont.						
Ceanothus sanguineus	redtsem ceanothus	6’	SI	X	5-8’	Commonly seral after fire, deciduous, nitrogen-fixer
Ceanothus velutinus	snowbrush	10’	SI	X	5-8’	Commonly seral after fire, evergreen, nitrogen-fixer
Cornus sericea	red-osier dogwood	20’	ST	WE,SS,M	5-8’	Takes sun if it has lots of moisture
Corylus cornuta	hazelnut	15’	ST	X	4-6’	Good wildlife habitat
Crataegus douglasii	black hawthorn	20’	SI	M,X	5-8’	Typically on meadow hummocks
Gaultheria shallon	salal	7’	ST-SD	X	2-3’	Basic forest groundcover
Holodiscus discolor	ocean spray	10’	SI-ST	X	6-10’	Drought-tolerant, edge-loving
Lonicera involucrata	black twinberry	10’	SI-ST	WE,SS,M	6-10’	Takes sun if has lots of moisture
Mahonia aquifolium	tall Oregon grape	4’	SD	X	3-4’	Dry sites
Mahonia nervosa	short Oregon grape	2’	ST-SD	X	2-3’	Dry sites
Malus fusca	western crabapple	35’	SI-ST	WE,M	5-8’	Edges
Oemleria cerasiformis	Indian plum	15’	SD	M,X	4-6’	Sub-canopy
Oplopanax horridus	Devil's club	7’	ST	WE,M	4-6’	Needs good drainage, forms thickets
Philadelphus lewisii	mock orange	10’	SI-ST	M,X	4-6’	Needs good drainage
Physocarpus capitatus	Pacific ninebark	20’	SI-ST	M,X	5-8’	Needs good drainage
Prunus virginiana	choke cherry	20’		X	5-8’	Native to the whole US
Rhamnus purshiana	cascara	30’	ST-SD	M	6-10’	Found in most wetlands
Ribes bracteosum	stink currant	10’	ST	M	5-8’	Transition
Ribes lacustre	prickly currant	7’	ST	M	4-6’	Can take drought
Ribes sanguineum	red-flowering currant	7’	SI	M,X	4-6’	Doesn't form thickets!
Rosa gymnocarpa	wood rose	7’	ST	X	3-4’	Tough, hardy
Rosa nutkana	Nootka rose	10’	ST	SS,M	3-4’	Rapid volunteer on damp soil
Rosa pisocarpa	clustered rose	7’	ST	WE,SS,M	3-4’	Will hybridize with nootka rose
Rubus leucodermis	black raspberry	10’	ST	X	6-10’	Good buffer planting
Rubus parviflorus	thimbleberry	10’	SI	M,X	4-6’	Seral groundcover in clear-cuts, drought tolerant
Rubus spectabilis	salmonberry	15’	HA	WE,M	4-6’	Takes sun if has lots of moisture
Salix geyeriana	Geyer willow	15’	SI	SW,WE	6-10’	Likes inundation, sluggish water, wet meadows
Salix lasiandra	Pacific willow	50’	HA	WE,SS,M	6-10’	Common, tolerant, riparian
Salix scouleriana	Scouler willow	35’	ST	SS,M		Upland & wetland

Scientific Name	Common Name	Max Ht.	Light Needs	Site Placement	Spacing	Comments
SHRUBS, cont.						
Salix sitchensis	Sitka willow	25’	HA	WE,SS,M	6-10’	Common, tolerant
Sambucus racemosa	red elderberry	20’	HA	M	5-8’	tolerates sun, seral on clear-cuts
Sorbus sitchensis	Cascade mountain ash	15’	SI-ST	M	6-10'	Not to be mistaken for *S. aucuparia*
Symphoricarpos albus	snowberry	7’	SI	M,X	3-4’	Common, tolerant
Vaccinium ovatum	evergreen huckleberry	5’	SD	M,X	4-6’	Prefers mature shade
Vaccinium parvifolium	red huckleberry	13’	SD	M,X	5-8’	Requires lots of organic matter

FERNS						
Athyrium filix-femina	lady fern	6’	ST	SS,M	4-6’	Very common, tolerant
Blechnum spicant	deer fern	2’	SD	M	2-4’	Needs shade, moisture, evergreen
Dryopteris expansa	wood fern	2’	SD	WE,SS,M	2-4’	Likes muddy soil
Gymnocarpium dryopteris	oak fern	16”	S	M	1.5-2’	Forms carpets
Polystichum munitum	western sword fern	4’	ST	M,X	4-6’	PNW basic; needs shade or moisture, evergreen
Pteridium aquilinium	bracken fern	5’	SI	X	2-4’	Seral on disturbed areas
RUSHES & SEDGES						
Carex obnupta	slough sedge	4.5'	ST	SW,WE,SS	1.5’	Extremely common
Carex rostrata (utriculata)	beaked sedge	3’	SI-ST	SW,WE,SS	1.5’	Common
Carex stipata	sawbeak sedge	3'	SI-ST	SW,WE,SS	1.5’	Lowland to mid-montane
Juncus ensifolius	dagger leaf rush	2'	SI	SW,WE,SS	1.5’	Lowland to mid-montane
Juncus oxymeris	pointed rush	3'	SI	SW,WE,SS	1.5’	Lowland
Scirpus microcarpus	small-fruited bulrush	4.5'	SI-ST	SW,WE,SS	1.5’	Lowland to mid-montane, very common
GRASSES						
Alopecurus aequalis	short-awn foxtail	1.5’	SI-ST	SW,WE,SS	1.5’	Often submerged
Alopecurus geniculatus	water foxtail	1.5'	SI-ST	SW,WE,SS	1.5’	Often submerged, tolerant
Beckmannia syzigachne	American sloughgrass	2'	SI	WE,SS	1.5’	Good wildlife forage, lowland to mid-montane
Calamagrostis canadensis	bluejoint reedgrass	3'	ST	WE,SS,M	1.5’	Rhizomatous, coastal to mid-montane
Cinna latifolia	wood reed	6'	ST	WE,SS,M	1.5’	Coastal to sub-alpine
Deschampsia caespitosa	tufted hairgrass	2'	SI	WE,SS,M	1.5’	Common, keystone species in wet meadows

Scientific Name	Common Name	Max Ht.	Light Needs	Site Placement	Spacing	Comments
GRASSES, cont.						
Elymus glaucus	blue wildrye	2'	SI	X	1.5’	Very drought-tolerant, good wildlife forage
Festuca idahoensis	Idaho fescue	2.5'	SI	X	1.5’	Drought-tolerant
Festuca occidentalis	Western fescue	2.5'	SI	X	1.5’	Open areas, forest edges
Festuca rubra var. rubra	red fescue	2.5'	SI	SS,M	1.5’	Common, tolerant
Glyceria borealis (occidentalis)	northern mannagrass	4'	ST	WE,SS	1.5’	Tolerates up to 3' of water
Glyceria elata	tall mannagrass	4.5'	SD	WE,SS,M	1.5’	Prefers streamside
Panicum occidentale	western panic-grass		SI	WE,SS,M	1.5’	Coastal to sub-alpine

Scientific Name	Common Name	Max Ht.	Light Needs	Site Placement	Spacing	Comments
HERBS, VINES & GROUNDCOVERS						
Achillea millefolium	yarrow	1'	SI	X	1-1.5’	Self-seeds, robust, tolerant
Anaphalis margaritacea	pearly everlasting	1'	SI	X	1-1.5’	Robust, tolerant
Arctostaphylos uva-ursi	kinnikinnick	1'	SI	X	1-1.5’	Slow grower - likes dry stony soil
Aruncus dioicus	goat's beard	2'	ST	M,X	1-1.5’	Streamside, edges
Caltha palustris	marsh marigold	9"	ST	SW,WE	1-1.5’	Coastal
Chimaphila umbellata or *menziesii*	pipsissewa	10"	ST	M	1-1.5’	Needs organic soil
Dicentra formosa	bleeding heart	1.5’	ST-SD	M,X	1-1.5’	Very common, tolerant
Epilobium angustifolium	fireweed	4'	SI	X	1-1.5’	Seral on clear-cuts, common, tolerant
Fragaria vesca	woodland strawberry	6"	SI	X	1-1.5’	Rapid spreader, evergreen
Geum macrophyllum	big-leaf avens	3'	ST	WE,SS,M	1-1.5’	Common
Heracleum lanatum	cow parsnip	6'	ST	WE,SS,M	1-1.5’	Likes riparian, self-seeds
Hieracium albiflorum	hawkweed	2’	HA	M,X	1-1.5’	common
Hydrophyllum tenuipes	Pacific waterleaf	12"	ST-SD	M	1-1.5’	Wet forest groundcover
Linnaea borealis	twinflower	6"	ST	M,X	1-1.5’	Usually in forests, but seral on clear-cuts
Lonicera ciliosa	orange honeysuckle	15’	ST	M,X	1-1.5’	Trailing/climbing vine
Lupinus polyphyllus	big-leaf lupine	3'	SI	X	1-1.5’	Seral, common, tolerant
Lysichiton americanum	skunk cabbage	10"	SD	SW,WE	1-1.5’	Common, typical PNW
Maianthemum dilatatum	wild lily of the valley	14"	ST	M,X	1-1.5’	Rapid spreader
Mimulus guttatus	yellow monkey flower	3'	SI	WE,SS,M	1-1.5’	Forms sheets near seeps
Oenanthe sarmentosa	water parsley	3'	ST	SW,WE,SS	1-1.5’	Common, hardy, good amphibian habitat
Osmorhiza chiloensis	sweet cicely	6"	ST-SD	X	1-1.5’	Very common in PNW forest
Oxalis oregana	wood-sorrel	9"	ST	M,X	1-1.5’	Very rapid spreader, robust, highly tolerant
Petasites frigidus	coltsfoot	20"	ST	WE,SS,M	1-1.5’	Rhizomatous, good spreader
Smilacina stellata	Solomon's Star	1.5’	ST	M	1-1.5’	Forms drifts near streams
Stachys cooleyae	Cooley hedge nettle	4'	SI-ST	M	1-1.5’	Common
Tellima grandiflora	fringecup	2'	ST	M	1-1.5’	Common, tolerant
Tiarella trifoliata	foamflower	2'	ST	M	1-1.5’	Common, tolerant
Tolmiea menziesii	piggy-back plant	30"	SD	M	1-1.5’	Forms drifts near streams
Trientalis latifolia	western starflower	6”	ST	M	1-1.5’	Often found in clumps around trees
Viola glabella	stream violet	7"	SI-ST	M	1-1.5’	Common, rapid spreader

7.3 Pruning

Pruning is a maintenance action used primarily in developed landscape areas. Pruning in natural areas should be limited to addressing hazard trees that pose a threat to public safety, and maintaining visibility through understory where specific security concerns dictate. Pruning can produce strong, healthy, attractive plants, but only if done well. Poorly pruned plants often develop problems far worse than when left alone. The need for pruning is minimized when plants are appropriately sited at the outset; plants outgrowing their available space should be evaluated for radical renovation or removal and replacement with more appropriate species. The first step in pruning is thus to evaluate whether it is the appropriate action for the situation, and to clarify pruning objectives.

Pruning can stimulate fruit production, invigorate a plant, promote growth, repair injury, and increase value of trees and shrubs. It also can reduce hazard and enhance wildlife habitat if dead wood remains on site. As a general rule, it is best to begin pruning by removing the "three D's": Dead, Diseased and Damaged wood. Always use clean, sharp pruning tools including handsaws, loppers, pruners, and where appropriate, chainsaws. Use of power tool by volunteers in Seattle parks is prohibited. All tree pruning must conform to current ANSI and ISA (International Society of Arboriculture) standards.

Trees

Prune for Safety

- Remove branches that grow too low and could cause injury or property damage.
- Trim branches that interfere with site lines on streets or driveways.
- Remove branches that grow into utility lines.
- Remove or trim branches in natural areas that are a hazard to public safety.

Prune for Health

- Create a strong structure when tree is young.
- Remove dead, diseased or damaged branches to increase strength and longevity of trees.
- Thin crown to increase airflow and reduce pest problems.
- Remove crossing and rubbing branches.
- Do not apply dressing to pruning wounds, as this may invite disease problems.

Prune for Aesthetics

- Enhance the natural form and character of the tree.
- Never 'top' trees. It is against adopted Parks Tree Policy (2001) to do so on public lands for views from private lands.

Shrubs

Prune for Health

- Follow principles of natural target pruning.
- Make cuts as close to the bud as possible.
- Do not make flush cuts.
- Do not leave stubs.
- Reinvigorate or regenerate overgrown plant.

Prune for Aesthetics

- Enhance balanced, natural shape of shrub species.
- Remove crowded and crossing branches.
- Remove terminal bud to stimulate lower branching.

- Remove reverted shoots on grafted cultivars.
- Enhance flowering and fruiting.

7.4 Removing Plants

Besides control of invasive non-native plants, removals are done for the following reasons: poor tree architecture, summer branch drop, increased exposure, root loss, unstable rooting, girdling roots, severe lean, cracks, cankers, conks, seams, decay, cavities, and root and butt diseases. Unfavorable soil conditions, chronic insect or disease problems, crowding and decline are additional reasons relating to shrubs and herbaceous plants as well. Trees in particular may present a risk because of old age, storm damage, poor structure, past construction activities or death of the tree. Derelict trees in natural areas that do not pose a hazard should be left standing to enrich wildlife habitat.

If a tree is defective AND has a target, it is considered a hazard.

- Remove derelict trees that cannot be made safe or functional by corrective pruning.
- Remove trees that constitute a high hazard if no other prescription will eliminate the risk.
- Alert the community before tree removal begins, to provide opportunity for comment.

At times, trees and shrubs may be removed for new park construction, access or other issues not related to the plant's viability. Cost and availability of funds for tree-spade work should be weighed against the cost of replacing the tree with a new, smaller caliper tree. Establishment of larger trees is often less successful than planting younger replacements.

- Determine value of specimen to be transplanted, by appraisal, when considering replacement vs. transplanting.
- Transplant trees smaller than 10-12" in diameter with a large tree-spade.
- Transplant shrubs by carefully digging rootball and placing in pots or balling and burlapping.
- Do not let roots dry out.
- Remove plant material that is too large for the allotted space.
- Remove plant material that is diseased or dead and dispose off site.

Large woody debris and brush piles are critical elements that are often lacking in habitat areas of Lincoln Park. When large trees have been removed, recycle as much of the woody debris on site as possible. Trunks and large branches that will not sprout can be placed directly on the ground within any of the habitat areas. Brush (i.e. non-sprouting limbs and branches) can be used for wildlife brush piles dispersed throughout park natural areas. Debris not used for brush piles can be chipped onsite and used as mulch.

CAUTION: Do NOT place trunks or large branches from non-native *Populus* species (Lombardy, white poplar, or their hybrids) directly on the ground. These species will live sprout from large woody debris kept in contact with moist soil. To use the remains of those species appropriately, prop them off the ground (on both ends) by placing the log on 6-8" thick pieces of wood from non-invasive species (red alder, big leaf maple). In that manner, the native softwood will rapidly decompose from direct contact with the soil while the potential live-sprouting log will dry out and become non-viable. Eventually poplar wood will rest on the ground while smaller pieces of wood decompose, resulting in large pieces of woody debris that pose no risk for sprouting and spreading unwanted invasive species.

7.5 Taking Care of Turf

Turf is the term applied to any lawn or grasses grown in the developed landscapes within the Park and is the traditional "green carpet" many visitors associate with parks. The wide variety of type of use indicates varied maintenance and management practices.

Maintenance

Mowing

Frequency

- Mow weekly from MARCH through OCTOBER; bi-weekly in FEBRUARY and NOVEMBER; and at least monthly in DECEMBER and JANUARY.

Cutting Height

- Mow to a height of 2 to 2.5 inches (avoid removing more than 1/3 leaf blade height at any one time). Care should be taken in areas where tree roots protrude above the ground surface, and mower height should be raised whenever possible to avoid excessive root damage.

Mulch Mowing

- Do not remove grass clippings from mowed turf areas.
- Alternate mowing patterns to avoid ruts and compaction from the wheels.
- Avoid driving on frozen turf.
- Avoid driving on wet ground where ruts will remain.

Trimming

- Use walk- behind mowers and line trimmers where site cannot be accessed by riding mowers, and around trees to avoid trunk damage from riding mowers.

Edging

- Edge 2 to 4 times per year, depending on the maintenance standard for the site.

Cultural Care

Fertilization

- Soil test routinely fertilized turf on a 4-year cycle.
- Provide turf fertilizer 5-1-4 NPK unless otherwise indicated by soil tests.
- Apply approximately 1 lb. of N per 1000 square feet.
- Fertilizers N should be approx. 50% water insoluble N preferable with some organic sources.
- Avoid applications during heavy rainfall to avoid runoff.
- Avoid applications in very hot weather.
- Irrigation systems should be operational before growing season applications.
- Mark sprinkler heads to avoid damaging them during truck applications.
- Add micronutrients and lime as soil tests indicate.

Use site-specific fertilizers, and only organic formulations near streams, wetlands, and shorelines.

Irrigation

- Apply approximately one inch of water per week.
- Monitor auto irrigation effectiveness on a weekly basis.

Aeration

- 2 to 3 times per year using .75 inch hollow tines.
- Best periods: March/April, late June, late August.
- Make two passes at 90 degree angles.

Top Dressing

- Use 80% coarse sand and 20% composted organic material.
- Most effective when done lightly and frequently.
- Apply ¼ inch, each application.
- Monthly applications in heavy wear areas during peak seasons.

Overseeding

- Overseed entire area at least once per year.
- Overseed in fall and slicer seed in spring.
- Overseed 5 lb. / 1000 square feet.
- Site characteristics, usage, and maintenance practices guide seed selection. Ideal sites (full sun, good drainage, reasonable fertility) are suited for perennial ryegrass blends. Lawns that are in partial shade or on poorly drained sites should be seeded with mixes of perennial rye and fescues. Avoid Kentucky Bluegrass.

Site Standards

Prominent Irrigated Lawn Areas:

These are high visibility or high use landscapes. Examples include: community center lawns; popular picnic/sunbathing areas; lawns adjacent to busy arterials.
Fertilization: 5-1-4 NPK ratio at 2 to 6 lb. N per year applied in 3 to 4 applications. Only organic fertilizers should be used near riparian areas.
Aeration: 2 to 3 times per year with conventional 0.75" hollow tines.
Overseeding: Once per year at 5 lb. per 1000 sq. Monthly applications in heavy wear areas.

General Irrigated Lawn Areas:

Fertilization: apply 5-1-4 NPK ratio at 1 to 2 lb. N per year applied in 1 to 2 applications. Only organic fertilizers should be used near riparian areas.
Aeration: 1 to 2 times per year with conventional 0.75" hollow tines.
Overseeding: as needed, in April/May and October.

Non-Irrigated Lawn Areas:

Fertilization: apply 5-1-4 NPK ratio once October/November, only organic fertilizers should be used near riparian areas.
Overseeding: as needed, in October.

Steep Slopes:

Leave unmowed or mow only once or twice per year. Replace existing slope vegetation with "low grow" turf cultivars or woody groundcovers.

Soil Based Athletic Fields:

Maintain as general irrigated lawn unless there is exceptionally high usage.
Fertilization: apply 5-1-4 NPK ratio at 2 to 6 lb. N per year applied in 3 to 4 applications.
Aeration: 2 to 3 times per year with conventional 0.75" hollow tines.
Overseeding: Once per year at 5 lb. per 1000 sq. ft or about 375 lb. per soccer field. Monthly in heavy wear areas such as goal mouths through the playing season.

Bathing Beaches:

Fertilization: apply 5-1-4 NPK ratio at 2 to 6 lb. N per year applied in 3 to 4 applications, only organic fertilizers should be used near riparian areas.
Aeration: 2 to 3 times per year with conventional 0.75" hollow tines.
Overseeding: Annually at 5 lb. per 1000 sq. ft. Monthly applications in heavy wear areas.

Design and Construction Issues:
Construct turf areas with a minimum slope of 2% to promote surface drainage and a maximum of 25% to allow riding mowers to safely access the areas.

7.6 Three Year Establishment Care

All new plantings require follow-up care for a period of three years that is more intensive and frequent than plants that are already established. Main components of this three year care program are: mulching, watering, and weeding. One time maintenance actions that are project dependent are things like removing tree stakes and inorganic sheet or fabric mulch. A three year calendar for these actions is shown below. Detailed instructions on how to perform these maintenance actions can be found in this section under the title of the specific practice, i.e. "Mulching" (Section 7.1). Once the three year period is over and the plantings have established, care of these planted areas should be incorporated into the regular ongoing maintenance within the management area that they are located.

Three Year Establishment Care Calendar

	Month													
Action	J	F	M	A	M	J	J	A	S	O	N	D		
At Time of Installation														
Mulching														
Watering														
Year 1														
Mulching								▒	▒	▒				
Weeding					•	▒	▒	▒	▒	▒				
Watering						•	•	•	•	•	•	•		
Removing Tree Stakes											▒	▒	▒	▒
Year 2														
Mulching								▒	▒	▒				
Weeding					•	▒	▒	▒	▒	▒				
Watering						•	•	•	•	•	•	•	•	
Removing Tree Stakes	▒	▒	▒	▒	▒	▒	▒							
Year 3														
Mulching				▒	▒						▒	▒	▒	
Weeding					•	▒	▒	▒	▒	▒				
Watering						•	•	•	•	•	•	•	•	
Removing Inorganic Mulch											▒	▒	▒	

▒ Indicates range of time to perform action as needed

• Indicates specific time to perform action

Mulching: See M&M Practice "Mulching".

Weeding: See M&M Practice "Weeding and Invasive Control".

Watering: All new plantings should be watered in at the time of planting. Regular three year watering should consist of at least 1" weekly for first two growing seasons, then taper to ½" weekly for plantings in natural areas. See M&M Practice "Watering".

Removing Tree Stakes: Do not use tree stakes in natural area plantings. Tree stakes used elsewhere should be removed after 1 year.

Removing Inorganic Mulch: Inorganic sheet mulch used in areas of severe invasive species problems should be removed during the dormant season after 3 years and entire area should be mulched with 4-5" layer of wood chips. Depending on site conditions and concern about re-invasion by weeds, entire planting area can be sheet mulched with a double layer of cardboard underneath the wood chips. Application of these techniques is usually limited to planting in natural areas and would not typically be necessary in a more developed landscape area.

7.7 Watering

Watering is the key to plant survival. Seattle receives an average of 39 inches of rain each year, but only 13 of those inches fall during the growing season. This is why summer watering is so important, particularly for plant installations in the first three years of establishment. Water management is a term used to describe the efficient use of supplemental irrigation, which is needed to sustain many planted landscapes in the Puget Sound region. By controlling the application of water for irrigation, water management conserves this resource, reduces urban runoff and saves money. For most efficient watering, establishment of an irrigation infrastructure for areas that require regular watering is recommended. Water sources for temporary irrigation during 3 year establishment care of newly planted areas may include watering trucks, fire hydrants (permit required), hoses from existing bibbs and permanent irrigation lines.

Irrigate the following Park areas:

- Newly installed landscapes.
- Athletic fields.
- Bathing beaches.
- High-use or high-visibility turf planting.
- High-use or high-visibility shrub and annual plant beds.

Do NOT irrigate:

- Low-use or low-visibility park turf areas.
- Turf meadow areas.
- Natural areas - except during period of establishment.

In general:

- Water new trees and shrubs thoroughly at planting.
- Provide water to new trees and shrubs during first two summers, totaling at least 1" per week of precipitation and/or irrigation; taper watering (to ½" weekly) in the third year.
- Established trees and shrubs do not require supplemental watering except during periods of extreme drought (dependent, however, on species characteristics).
- Water valuable, specimen trees and high-use or high-visibility planting beds during periods of extreme drought even if established.
- Prepare irrigation systems for season as weather warms in spring; early irrigation may be required during early dry periods, especially following or during ongoing drought conditions.

- Field check soil moisture for drying regularly from May through late September: water content will vary significantly with soil type, temperature, drainage and year-to-year.
- Modify turf irrigation around established trees to accommodate the water requirements of the trees.
- Do not direct water spray on tree trunks.

See Seattle DPR Landscape, Horticulture and Urban Forestry Best Management Practices Manual (BMPs) (1999) for additional information on irrigation systems. See Planting (Section 7.2), and 3 Year Establishment Care (Section 7.6) for instructions on watering newly installed trees and shrubs.

7.8 Weeding and Invasive Plant Control

Weeding and controlling invasives are necessary as an ongoing maintenance action throughout the Park in developed landscaped areas as well as natural areas. In addition, most natural area planting projects will include initial removal and ongoing control of invasives as a major component of the project.. Invasive control is also an important part of 3-year establishment care for all newly planted areas throughout the Park. The most commonly occurring and problematic non-native invasive species in the Park are listed below with a brief description of their characteristics, some information about where each species is typically found in the Park, and some recommended eradication and control methods for that particular species. Recommendations and protocols (including herbicide use) are in accordance with DPR's 1999 Landscape, Horticulture, and Urban Forestry BMPs), and focus on using an integrated pest management approach characterized by a combination of control and removal methods.

Generally, the most effective long-term control of invasive species is achieved by using a combination of control methods, reducing site disturbance, and establishing healthy native plant communities. All control efforts should be directed over time towards establishing and maintaining more sustainable plant communities. To this end, weedy species and infestations that pose the greatest threat to healthy desirable plant communities are those that should be targeted. In addition, to keep the weed control workload at the most reasonable level possible, new infestations should be targeted for control before they become widespread or well-established, and the extent of current invasion should be controlled at or below existing levels for those species that threaten to spread.

Thus, invasive control should focus on those species and specific infestations that are:
1) the fastest-growing,
2) the least established but potentially threatening,
3) the most disruptive to functional habitat, and
4) listed noxious weeds with mandated control.

Large woody debris and brush piles are critical elements in the natural areas of the Park. When large trees have been removed, recycle as much of the parts of the woody debris on site as possible. Trunks and large branches that will not live sprout can be placed directly on the ground within any of the habitat areas, except for within the existing small wetlands on site. Brush (non-sprouting limbs and branches from the tree tops) can be used for wildlife brush piles. . Other plant debris not appropriate for wildlife features should be disposed of following current DPR protocol. In accessible areas (developed landscapes accessed by roads), debris can be removed from the site. In more remote natural areas debris can be piled or stacked off the ground and left on-site to decompose.

The following text describes in detail how to remove non-native invasive plants identified as a significant presence at Lincoln Park. At the end of the text are found tables describing specifics such as removal quantities, seasonal timing, replacement ratios, and removal intervals for major targeted species. Non-native invasive species that are not specified in these tables can be removed without limitation, as appropriate.

Invasive Removal – Noxious Weeds

All listed noxious weed species found in Lincoln Park will be controlled as required by County regulations and in accordance with Seattle Parks BMP's.

Invasive Removal – Tree Species (canopy species >20' tall at maturity)

Non-native Poplar *(Populus alba, Populus nigra, and cultivars and hybrids)*

This genus is known for its stump sprouting and suckering, so removals must include treatment of the cut stump with an herbicide to be effective. Trees should be cut, and the stumps immediately painted with an appropriate herbicide mixed with a water-soluble dye. On large stumps, paint only the outer 2-3"; on stumps 3" or less in diameter, paint the entire stump. A 25% solution of Garlon 4 is recommended in upland areas away from aquatic resources e.g. shoreline, wetlands. Within 100' of aquatic resources, a 50% solution of Rodeo in a water base (no surfactant) is recommended. Treated cut stumps should be checked for resprouts every 2 to 6 months for the first year after cutting and re-treated if necessary. Logs and limbs can be used in natural areas for habitat features. To avoid resprouting, they should be stored off the ground for 2 years or until non-viable, before placing in natural areas.

English Holly (Ilex aquifolium)
English Laurel (Prunus laurocerasus)
Portugal Laurel (Prunus lusitanica)

Laurel and holly are broad-leaved evergreen trees (initially, shrubs) that are spread readily by birds due to their prolific and tasty fruit and abundance in the general landscape. These species also sucker and re-sprout vigorously. Laurel and holly prefer – but do not require - partial shade and are generally found in upland forest in the understory, or along forest edges.

Removal of these species should be a high priority. Young plants can be pulled by hand, removed with a weed wrench, or grubbed using pick or shovel. Plants too large to remove with roots intact are most effectively eliminated by a combination of mechanical means and herbicide. A 25% solution of Garlon 4 is recommended in upland areas away from aquatic resources (e.g. shoreline, wetlands). Within 100' of aquatic resources, a 50% solution of Rodeo in a water base (no surfactant) is recommended. Herbicide should be mixed with a water-soluble dye. Several cut–and-paint methods can be used:

1) Cut shrub to a stump at or near ground level and paint entire cut surface immediately with herbicide.
2) Cut shrub to a stump at or near chest level and with a portable drill, make 1/8" diameter holes 1" deep into the stump from the outer sides all the way around the circumference of the stump every 2". Then inject herbicide with syringe

directly into each hole. If standing dead brush is desired, this method can be used without cutting the plant to a stump.

3) Girdle the standing plant by making a series of downward overlapping cuts all the way around the trunk (also called frilling), leaving the chips attached to the trunk at the base of the cut. Then paint herbicide onto fresh cuts. This technique should be used before fruit production so that standing dead plant does not have fruit on it.

Treated cut stumps should be checked for resprouts every 2 to 6 months for the first year after cutting and re-treated if necessary. If no herbicide is used, repeated cutting will be required to weaken and eventually kill the plant over time. This is a more labor-intensive method and will require diligent follow-up visits over a period of at least several years to remove suckering growth resulting from initial cutting.

Invasive Removal – Shrub Species (< 20' tall at maturity)

Cotoneaster lacteus *(formerly C. Parnyi)*

Cotoneaster is a large shrub that spreads by prolific fruit production that is excellent bird forage. It is found throughout the landscaped edge along Fauntleroy Way, and is spreading throughout the forested natural areas of Lincoln Park.

The most effective technique is to removal the entire plant with the roots intact. If it is too large, the next option will be to cut individual shrubs and apply herbicide directly to the cut surface to prevent resprouting. A 25% solution of Garlon 4 is recommended in upland areas away from aquatic resources e.g. shoreline, wetlands. Within 100' of aquatic resources, a 50% solution of Rodeo in a water base (no surfactant) is recommended. Herbicide should be mixed with a water-soluble dye. Several cut and paint methods can be used:

1) Cut shrub to a stump at or near ground level and paint entire cut surface immediately with herbicide.
2) Cut shrub to a stump at or near chest level and with a portable drill, make 1/8" diameter holes 1" deep into the stump from the outer sides all the way around the circumference of the stump every 2" or one hole for every 1" dbh. Holes should be drilled at a slight downward angle. Then inject herbicide with syringe directly into each hole. If standing dead brush is desired, this method can be used without cutting the plant to a stump.
3) Girdle the standing plant by making a series of downward overlapping cuts all the way around the trunk (also called frilling), leaving the chips attached to the trunk at the base of the cut. Then paint herbicide onto fresh cuts. This technique should be used before fruit production so that standing dead plant does not have fruit on it.

Treated cut stumps should be checked for resprouts every 2 to 6 months for the first year after cutting and re-treated if necessary. If no herbicide is used, repeated cutting will be required to weaken and eventually kill the plant over time. This is a more labor-intensive method and will require diligent follow-up visits over a period of at least several years to remove suckering growth resulting from initial cutting.

Ongoing control of shoots newly emerging from past fruit dispersal should occur with implementation of prescribed mowing regimen in meadow areas.

Himalayan Blackberry (Rubus procerus)
Evergreen blackberry (Rubus laciniatus)
Both non-native blackberry species are found in Lincoln Park, although Himalayan blackberry is far most prevalent. Eradication and control methods for these two species are the same. Blackberry is found in upland areas throughout the Park, as an understory species along forest edges, and in dense monotypic stands in open areas. Blackberry is shade-intolerant, so long-term control is linked to successful establishment of healthy native plant communities that will create undesirable conditions for this species.

Removal methods include hand grubbing with root removal, repeated cutting or mowing, cutting and dabbing stubs with herbicide (cut and dab), or combinations of two or more of these techniques. Hand-grubbing is generally only a reasonable method for small areas, or for maintenance around trees or shrubs. If herbicide is used, a glyphosate herbicide is recommended – Roundup for upland areas and Rodeo for areas within 100' of an aquatic resource. The method(s) chosen depends mainly on how bad the infestation is, and the available labor resources.

Removal, other than in areas with sparse occurrences and a relatively intact healthy existing plant community, should not be done unless subsequent replacement planting is planned. For sparse occurrences, hand-grubbing is recommended. Removal of thickets will result in displacement of wildlife that may use these areas for cover and forage. Therefore, whenever possible removal work should accommodate wildlife by occurring after July 31st. Depending on the removal method chosen, this may not always be possible, and maximum removal effectiveness may take precedence over wildlife impacts.

In general if herbicide is used, timing of its application should coincide with the time of year that the target plant is most actively growing and translocating resources to its roots to maximize herbicide effectiveness. For Himalayan blackberry, this is generally considered to be mid-summer during flowering. For removal of denser stands or thickets the following methods are recommended:

1) Mow or cut to the ground numerous times during the growing season (May-Oct) to reduce plant vigor. If combining with an herbicide treatment, do a late summer (July) cut and dab (herbicide) treatment on resprouts. Herbicide should be applied to fresh cuts immediately (within 30 min.) for most effective treatment. In fall, after final mowing, plant and apply double layer of cardboard sheet mulch covered with 4-6" of mulch. Note: This method, while effective, does not accommodate wildlife as much as other methods, and for this reason may not be preferred.

OR

2) Mow or cut to the ground late in the growing season (after July 31st), and immediately cover entire area with heavy weed fabric firmly stapled to the ground. In fall, cut slits in the fabric to install plants. After 2-3 years, remove fabric, hand pull any resprouts, and apply double layer of cardboard sheet mulch covered with 4-6" of wood chips.

OR

3) Mow or cut to the ground late in the growing season (after July 1st) and either dab cut ends at that time, or cut and dab resprouts late in the summer when they appear.

Removal of large stands should be done incrementally, as thickets provide forage, refuge and cover for wildlife. Native wildlife should have nearby comparable habitat to take the place of what is removed. In edge habitat where invasion is low and coverage sparse, replant gaps created by removals with native species to prevent re-colonization, based on site-specific evaluation.

Scot's broom (Cytisus scoparius)
Gorse (Ulex europaeus)

Scot's broom and Gorse - which it resembles - are found in open dry areas in Lincoln Park, established and colonizing in open areas and along forest edges and bluff. Where well-established, like blackberry these species form monotypic stands or thickets. Gorse is a listed noxious weed and its active control therefore required. Ongoing efforts to eradicate should continue wherever this species remains or reappears.

Scot's broom is shade-intolerant, so long-term control is linked to successful establishment of healthy native plant communities that will create undesirable conditions for this plant species. Scot's broom provides some cover and refuge for wildlife, but its habitat function is not high. It produces large quantities of self-dispersed, long-lived seed. Removal of plants of seed-producing age is the most labor intensive, but crucial to reduce spread and seed accumulation. Removal of younger plants is easier because they can be hand-pulled or mowed, and also important to keep seed-producing population from expanding and becoming more widespread.

Thicket removal can be done incrementally as resources are available, and should not be done unless subsequent replacement planting is planned. Plants can be removed by mowing, hand-cutting individual plants, or manual removal and grubbing with shovels, weed wrenches or machinery, which may be the least desirable due to soil disturbance and increased broom seed germination and seedling emergence it causes. It may be desirable to strip the duff layer of seeds from the ground as part of the removal strategy. If this is the case, the plant removal method with the least disturbance to the soil should be used. Cutting should be done early in the summer when flowering has just started. Cutting should be followed by annual (or more frequent) cutting, or by herbicide treatment (Roundup with water soluble dye) of cut stems/stumps.

Broom thickets could be used as early establishment areas for later successional trees and shrubs. The basic concept is to underplant the thicket with desirable natives that will then form the foundation of the native community that will replace the broom. Once the installed plantings have established, broom can be removed by hand-cutting and removal of the roots or a cut and dab herbicide treatment.

Hand-pulling of smaller infestations of young plants (3' tall and smaller) should be done when soil is moist and loose (fall-spring). In edge habitat where invasion is low and coverage is sparse it may be advisable to replant with native species to prevent re-colonization. This determination should be made on a site specific basis.

English Ivy (Hedera helix)

English ivy is a broadleaved evergreen found in the forest ground layer and climbing up tree trunks in much of the park. Ivy is shade-tolerant, and forms dense mats on the ground. Hand-pulling appears to be the most effective removal method for this plant. Any efforts to control ivy should initially target vines climbing into trees. Vines should be cut at shoulder height and again at the base of the tree all the way around its circumference. For safety reasons, cut vines should not be pulled out of trees. A radius of at least 5' all around the base of the tree also should be cleared of ivy.

Patches of ivy on the ground are best removed by hand-pulling and rolling into a mat. Removal of dense mats in the ground layer should only be undertaken if coupled with deep mulching and/or replanting. New planting areas should have an additional 10'-wide strip cleared around the edges. Removal of sparse occurrences of ivy can be done without replacement planting, where existing native species exist and can rebound and refill the area. Control in areas of low infestation should receive high priority, to prevent further ivy spread.

Removal Schedule Laurel and Holly

Removal Size	All sizes
Removal Strategy	Remove individuals and return once yearly to check for and remove re-sprouts in conjunction with 3 year establishment care.
Removal Quantity	Limited only by resources for replanting and 3 yr. establishment care
Landscape Setting	Any Zone, any M.A.
Timing	Depends on strategy chosen but July 1 - April 1 is preferred
Maximum Annual Removal Quantity	Limited only by resources for replanting and 3 yr. establishment care
Removal Interval	3 years
Replanting Strategy	Replacement planting is necessary only where removed plants are in the mature shrub stage or at sapling ht. of >4'. Replace lost aerial coverage with equal area of tree and shrub plant community at removal location, ***OR*** around edges of nearest adjacent forest patches. 3-yr. establishment care is required.
Replanting Densities	Trees: 500/acre = 0.012/sq. ft. (min. 25-50% evergreen) and Shrubs: 1200-2500/acre = 0.028-0.058/sq. ft. (shrub density depends on optimal spacing for species used)
Species Composition of Replacement Planting	Xeric or Mesic plant community depending on microclimate conditions and existing vegetation at replanting location

Removal Schedule for Blackberry Thickets (Himalayan, Evergreen)

Size of thicket	<50 sq. ft.	<50 sq. ft.	>50 sq. ft. to 1/10 acre	>1/10 acre
Landscape Setting	***Not*** contiguous with shrub or forest habitat, ***and not*** in Shoreline MA	Contiguous with shrub or forest habitat, ***or*** in Shoreline MA	Any Zone, any M.A.	Any Zone, any M.A.

Removal Strategy	Remove entire thicket and return for follow-up removal of re-sprouts at least twice during the next 2 growing seasons.	Remove entire thicket and return for follow-up removal of re-sprouts at least twice during the next 2-3 growing seasons in conjunction with 3 year establishment care of new plantings.	Remove entire thicket and return for follow-up removal of re-sprouts at least twice during the next 2-3 growing seasons in conjunction with 3 year establishment care of new plantings.	Remove 1/3 total thicket area up to 1/10 acre and return for follow-up removal of re-sprouts at least twice during the next 2-3 growing seasons in conjunction with 3 year establishment care of new plantings.
Timing	Depends on strategy used: July 1 - April 1 is preferred	Depends on strategy chosen but July 1 - April 1 is preferred	Depends on strategy chosen but July 1 - April 1 is preferred	Depends on strategy chosen but July 1 - April 1 is preferred
Max. Annual Removal Area	unlimited	Limited only by resources for replanting and 3 year establishment care	Limited only by resources for replanting & 3 year establishment care	Not to exceed 1/3 total acreage of blackberry thickets of this size class in Park
Thicket Size	<50 sq. ft.	<50 sq. ft.	>50 s.f. - 1/10 acre	>1/10 acre
Removal Interval	none	none	none	Every 3 years at the successful completion of 3 yr. establishment care period for previously removed area
Replanting Strategy	No replanting required	Replant removal area with trees and shrubs if contiguous to forest, shrubs if contiguous to shrub habitat. 3-yr. establishment care is required.	Replant removal area with trees and shrubs if contiguous to forest, shrubs if contiguous to shrub habitat. 3-yr. establishment care is required.	Replant removal area with trees and shrubs if contiguous to forest, shrubs if contiguous to shrub habitat. 3-yr. establishment care is required.
Replanting Densities	NA	Trees: 500/acre = 0.012/sq. ft. (min. 25-50% evergreen) Shrubs: 1200-2500/acre = 0.028-0.058/sq. ft. (shrub density depends on optimal spacing for species used)	Trees: 500/acre = 0.012/sq. ft. (min. 25-50% evergreen) Shrubs: 1200-2500/acre = 0.028-0.058/sq. ft. (shrub density depends on optimal spacing for species used)	Trees: 500/acre = 0.012/sq. ft. (min. 25-50% evergreen) Shrubs: 1200-2500/acre = 0.028-0.058/sq. ft. (shrub density depends on optimal spacing for species used)
Species Composition of Replacement Planting	NA	Xeric or Mesic plant community depending on microclimate conditions and existing vegetation at replanting location	Xeric or Mesic plants depending on microclimate conditions and existing vegetation at replanting location	Xeric or Mesic plant community depending on microclimate conditions and existing vegetation at replanting location

Removal Schedule for Scot's Broom Thickets

Size of thicket	<50 sq. ft.	>50 sq. ft.
Landscape Setting	Any Zone, any M.A.	Any Zone, any M.A.
Removal Strategy	Remove entire thicket and return for follow-up removal of re-sprouts at least twice during the next 2 growing seasons.	Remove entire thicket and return for follow-up removal of re-sprouts at least twice during the next 2-3 growing seasons in conjunction with 3 year establishment care of new plantings.
Timing	Depends on strategy chosen but July 1 - April 1 is preferred	Depends on strategy chosen but July 1 - April 1 is preferred
Max. Annual Removal Area	unlimited	Limited only by resources for replanting and 3 yr. establishment care
Removal Interval	none	none
Replanting Strategy	No replanting required	Replant removal area with trees and shrubs. 3-yr. establishment care is required.
Replanting Densities	NA	Trees: 500/acre = 0.012/sq. ft. (min. 25-50% evergreen) and Shrubs: 1200-2500/acre = 0.028-0.058/sq. ft. (density depends on optimal spacing for species used)
Species Composition of Replacement Planting	NA	Xeric plant community

Removal Schedule for English Ivy

Size of Patch	Any size
Landscape Setting	Any Zone, any M.A.
Removal Strategy	Remove any size patch and return twice yearly during the next 2-3 growing seasons to check for and remove re-sprouts in conjunction with 3 year establishment care.
Timing	Depends on strategy chosen
Max. Annual Removal Area	Limited only by resources for replanting and 3 year establishment care
Removal Interval	none
Replanting Strategy	Replant cleared area with shrubs or trees and shrubs for any ivy removed from the ground. 3 year establishment care is required. Ivy can be cut from trees per described removal protocol without any replacement planting.
Replanting Densities	Trees: 500/acre = 0.012/sq. ft. Shrubs: 1200-2500/acre = 0.028-0.058/sq. ft.
Species Composition of Replacement Planting	Xeric or Mesic shade-tolerant community depending on microclimate conditions